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Elateridae (Insecta, Coleoptera) from Yaku Island (Ryukyu Islands, Japan)

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Abstract

The elaterid beetle fauna has been thoroughly investigated on Yaku Island, one of the Ôsumi Islands, Ryukyu Islands, Japan, and many species have been added to or excluded from the fauna. However, the fauna is difficult to assess because there is discordance in the information from the distribution records. In this study, we examined specimens collected by us as well as reviewed previous records from Yaku Island understand the elaterid beetle fauna of the island. During our fieldwork, we found 43 species, but no newly recorded species. Based on references and specimen information, the distributions of four species are discussed: *Rismethus ryukyuensis* Ôhira, 1999, *Elater niponensis* (Lewis, 1894), *Zorochros* (*Yamatostrius*) *osawai* (Ôhira, 1972), and *Paracardiophorus opacus* (Lewis, 1894). Of these, *E. niponensis* and *P. opacus* are removed from the list of species occurring on the island. As a result, 95 species in 48 genera of six subfamilies have been confirmed on Yaku Island, and a checklist of these elaterid species is provided.

Keywords

Check list, distributional record, elaterid beetles, geographical boundary, Palearctic region

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Introduction

Yaku Island is located nearly 60 km southwest of Kyushu, in the Ôsumi Islands, part of the northernmost Ryukyu Islands, Japan. Yaku Island is located just north of the boundary between the Palearctic and Oriental regions. Therefore, it occupies an important position for biodiversity and biogeography, and its entomofauna has been thoroughly investigated. Okadome (1973) recognized 1,896 insect species records, and Yamane (2006) estimated that 3,054 insect species were recorded from the island. Nakane and Kishii (1958) reviewed the Yaku elaterid records for the first time and recognized 35 species. Subsequently, Kishii (1959) confirmed 50 species, and Chûjô (1973) later confirmed 65 species from Yaku Island. Okadome (1973) listed 68 elaterid species. Nakane (1984) reviewed the Coleoptera of the island and listed 76 elaterid species. Hirashima (1989) compiled a Japanese insect list and confirmed 85 elaterid species from Yaku Island. In the Japanese elaterid species checklist, Kishii

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(1999) recognized 89 species from the island. However, there is discordance between information from these checklists and distributional records from Yaku Island. Moreover, many species have been added and excluded from Yaku Island elaterid fauna since the work of Kishii (1999) (see Kubota 2001; Ôhira and Sano 1999; Suzuki 2002; Takakuwa and Fujita 2010; Arimoto 2011, 2022). Therefore, the elaterid fauna of Yaku Island is difficult to assess. This paper reports species collected from fieldwork, reviews the already published records, and provides a check list of elaterids from the island.

Study Area

Yaku Island belongs to the Ôsumi Islands, where it neighbors Kuchinoerabu, Tanegashima, and Mage islands and Nakanoshima Island in the northern part of the Tokara Islands (Fig. 1A). Yaku Island has an area of 504 km^2, making it the ninth largest island in Japan after the main islands (Geospatial Information Authority of Japan, https://www.gsi.go.jp/KOKUJYOHO/MENCHO-title.htm). The island has a maximum elevation of 1,936 m and ranges from subtropical to temperate (Kyushu Regional Forest Office, https://www.rinya.maff.go.jp/kyusyu/yakusima/sub3.html); 90% is forested, and 21% is classified as a World Heritage Site (UNESCO, https://whc.unesco.org/en/list/662/).

Methods

Fieldwork was conducted at 28 localities on Yaku Island from 2017 to 2019 (Fig. 1B). This involved looking, sweeping, beating, spraying, and using simple light traps (SLT) made by combining a flight interception trap with a 4-W chemical fluorescent light for catching insects. The latitude and longitude of each collection locality were recorded using a global positioning system receiver (Garmin GPS map 62s; map datum WGS84) (Table 1). Altitude was obtained from Google Earth Pro v. 7.3.4.8248 based on the recorded latitude and longitude. The research activities on Yaku Island were approved by the Environment and Forestry Affairs, Department Nature Conservation Division, Kagoshima Prefecture (Kagoshima City, Kagoshima Prefecture), Yakushima District Forest Administration Office (Kumage District, Kagoshima Prefecture), and Yakushima Forest Ecosystem Conservation Center (Kumage District, Kagoshima Prefecture).

The specimens collected in the field were dried and mounted for morphological observation. Specimen codes are provided for the material and are given in square brackets. All specimens are deposited in the first author's collection and will be transferred to a public institute in Japan. One *Elater niponensis* (Lewis, 1894) specimen was also examined in the Ôhira collection of the Osaka Museum of Natural History (OMNH; Osaka, Japan) to review the record of *E. niponensis* from Yaku Island. The methods used for observing and dissecting specimens, taking photographs, and depositing the dissected parts generally followed those of Arimoto (2022). Measurements were made based on the specimen examined. Specimens were identified using descriptions and identification keys (Nakane and Kishii 1958; Kishii 1970, 1975, 1976a, 1976b, 1977, 1979, 1982, 1983a, 1985, 1986, 1988, 2001; Ôhira 1971, 1982, 1988, 1992, 1996b, 1997c, 1998a, 1998b, 1998c, 1998d, 1999d, 2001a, 2002a, 2004, 2005;

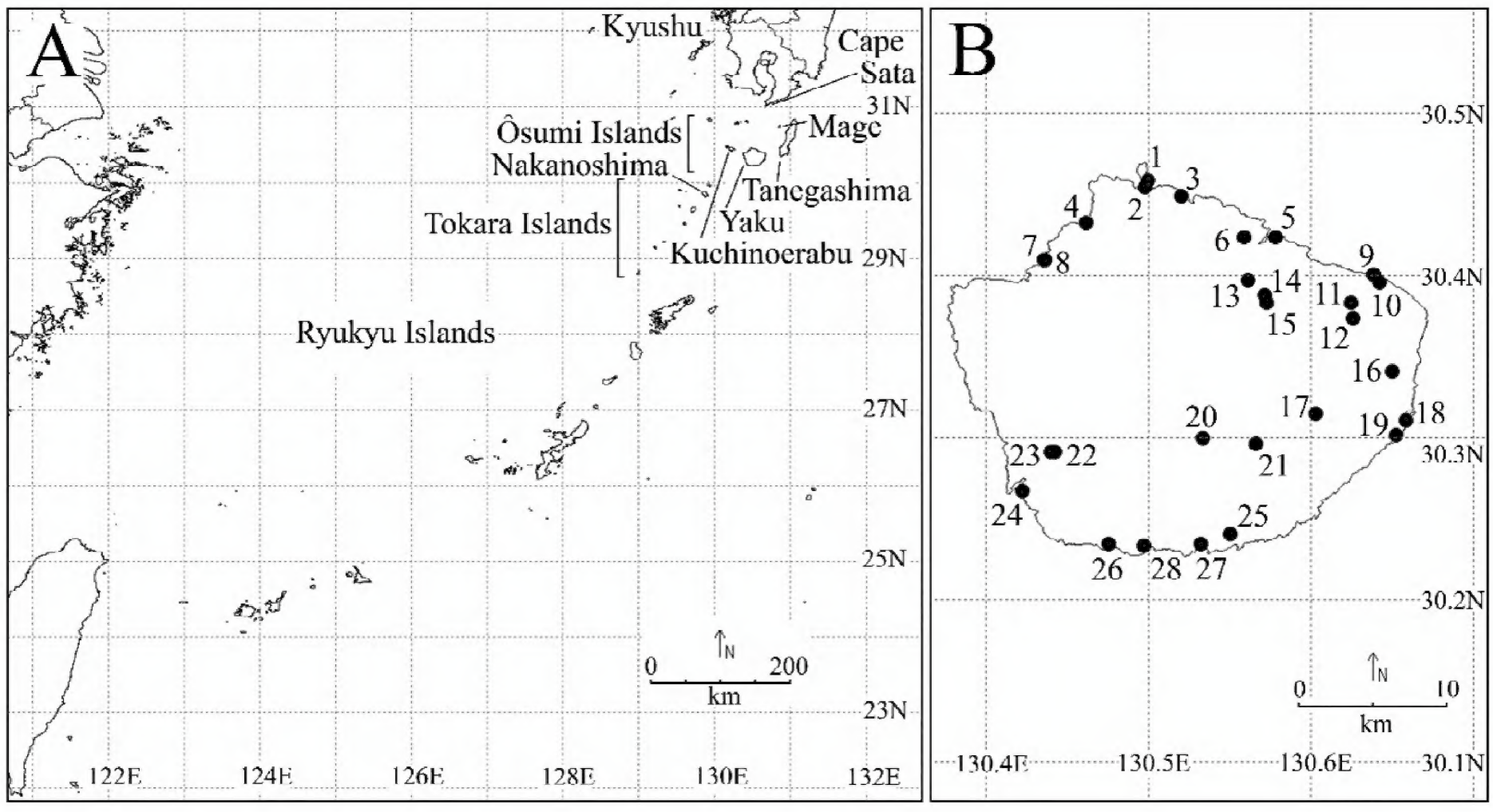

Figure 1. Map of the Ryukyu Islands, Japan. **A**. Location of the Ôsumi Islands in the Ryukyu Islands, showing the locations of the islands mentioned in this study. **B.** Map of Yaku Island showing the collection sites of the material used here. The numbers correspond to the site numbers in Table 1.

Table 1. Collection sites of the materials used in this study on Yaku Island, Japan. All sites belong to Yakushima Town, Kumage District, Kagoshima Prefecture.

Site	Locality name	Latitude (N)	Longitude (E)	Altitude (m)	Date
1	Issô	30.4584	130.4999	30	4.V.2017
2	Issô	30.4544	130.4976	4	14.VII.2017
3	Shitogo	30.4492	130.5199	5	4.V.2017
4	Yoshida	30.4329	130.4618	20	13.VII.2017
5	Miyanoura	30.4236	130.5777	1	3.V.2017, 18.VII.2018
6	Miyanoura	30.4235	130.5586	20	13.VII.2017
7	Nagata, Nagatainaka Beach	30.4099	130.4357	6	4.V.2017
8	Nagata, near Nagatainaka Beach	30.4097	130.4360	10	4.V.2017, 13.VII.2017
9	Koseda	30.4009	130.6383	5	18.VII.2018
10	Koseda	30.3960	130.6424	40	6.V.2017
11	Koseda	30.3831	130.6244	190	18.VII.2018, 5.V.2019
12	Koseda	30.3737	130.6260	240	18.VII.2018
13	Miyanoura, along Prefectural Route 594	30.3971	130.5614	360	14.VII.2017
14	Miyanoura, along Prefectural Route 594	30.3882	130.5713	580	14.VII.2017
15	Miyanoura, along Prefectural Route 594	30.3833	130.5727	640	14.VII.2017
16	Funayuki	30.3408	130.6502	170	6.V.2019
17	Anbô, along Prefectural Route 592	30.3151	130.6030	630	19.VII.2018
18	Anbô	30.3106	130.6587	5	3.V.2017
19	Anbô, Haruta Beach	30.3013	130.6527	5	19.VII.2018
20	Onoaida, near Yodogawa Trailhead	30.2995	130.5337	1370	6.V.2017
21	Mugio, along Prefectural Route 592	30.2959	130.5660	1180	6.V.2017
22	Kurio, Kuromi Forest Road	30.2914	130.4424	450	4.V.2017
23	Kurio, Kuromi Forest Road	30.2913	130.4401	430	5.V.2017
24	Kurio, Kurio Beach	30.2671	130.4222	6	3.V.2017
25	Onoaida	30.2404	130.5502	90	5.V.2017
26	Yudomari	30.2347	130.4754	6	20.VII.2018
27	Kojima	30.2342	130.5323	4	3.V.2017, 20.VII.2018
28	Hirauchi	30.2334	130.4970	60	20.VII.2018

Ôhira and Suzuki 1985; Ôhira and Hiramatsu 2002). The classification of the family Elateridae follows Douglas et al. (2021). The morphological nomenclature system generally follows Douglas (2017). A checklist was made, incorporating information from the current study and those of Okadome (1973), Nakane (1984), Hirashima (1989), and Kishii (1999).

Results

A total of 407 elaterid beetle specimens belonging to five subfamilies, 25 genera, and 43 species were collected in the field. All species have already been recorded from Yaku Island.

Family Elateridae Leach, 1815
Subfamily Agrypninae Candèze, 1857

Aeoloderma brachmana (Candèze, 1859)

Figure 2A

Aeolus brachmana Candèze 1859: 345.
Heteroderes brachmana—Candèze 1888: 676.
Aeoloderma brachmana—Fleutiaux 1928: 135.
Aeolis pardus Candèze 1859: 345.
Aeolus tessellatus Motschulsky 1860: 518.
Heteroderes multilineatus Candèze 1878: 118.
Heteroderes ancoralis Schwarz 1901: 24.
Aeolus vittatus Matsumura 1910: 37.

Material examined. JAPAN – **Kagoshima Prefecture**
• Kumage District, Yakushima Town, Kojima (Site 27); 30.2342°N, 130.5323°E; 4 m alt.; 3.V.2017; K. Arimoto, R. Itô, R. Noda leg.; by beating herbaceous plants around cultivated land during the day; 1♂ [21AeB01].

Identification. Body length 5.5 mm; color black and orange, with markings, antennae orange, legs orange to yellow; body covered with yellow setae; antennae extending beyond pronotum posterior lateral apices by apical one or two antennomeres in male, not reaching pronotum posterior lateral apices by apical antennomere in female; antennomeres IV–X serrate; promotum slightly shorter than wide; hind angles of pronotum not carinate; hind wings long; tarsomere IV lamellate.

Agrypnus (*Agrypnus*) *binodulus binodulus* (Motschulsky, 1861)

Figure 2B

Lacon binodulus Motschulsky 1861: 8.
Agrypnus binodulus—Ôhira 1954: 14.
Lacon albomaculatus Miwa 1934: 68.

Material examined. JAPAN – **Kagoshima Prefecture**
• Kumage District, Yakushima Town, Yoshida (Site 4); 30.4329°N, 130.4618°E; 20 m alt.; 13.VII.2017; K. Arimoto, R. Itô leg.; at streetlight; 1♀ [21AB01].

Identification. Body length 14.9 mm; color blackish brown to reddish brown; body covered with intermixed brown and yellowish-white, scale-like setae; antennae

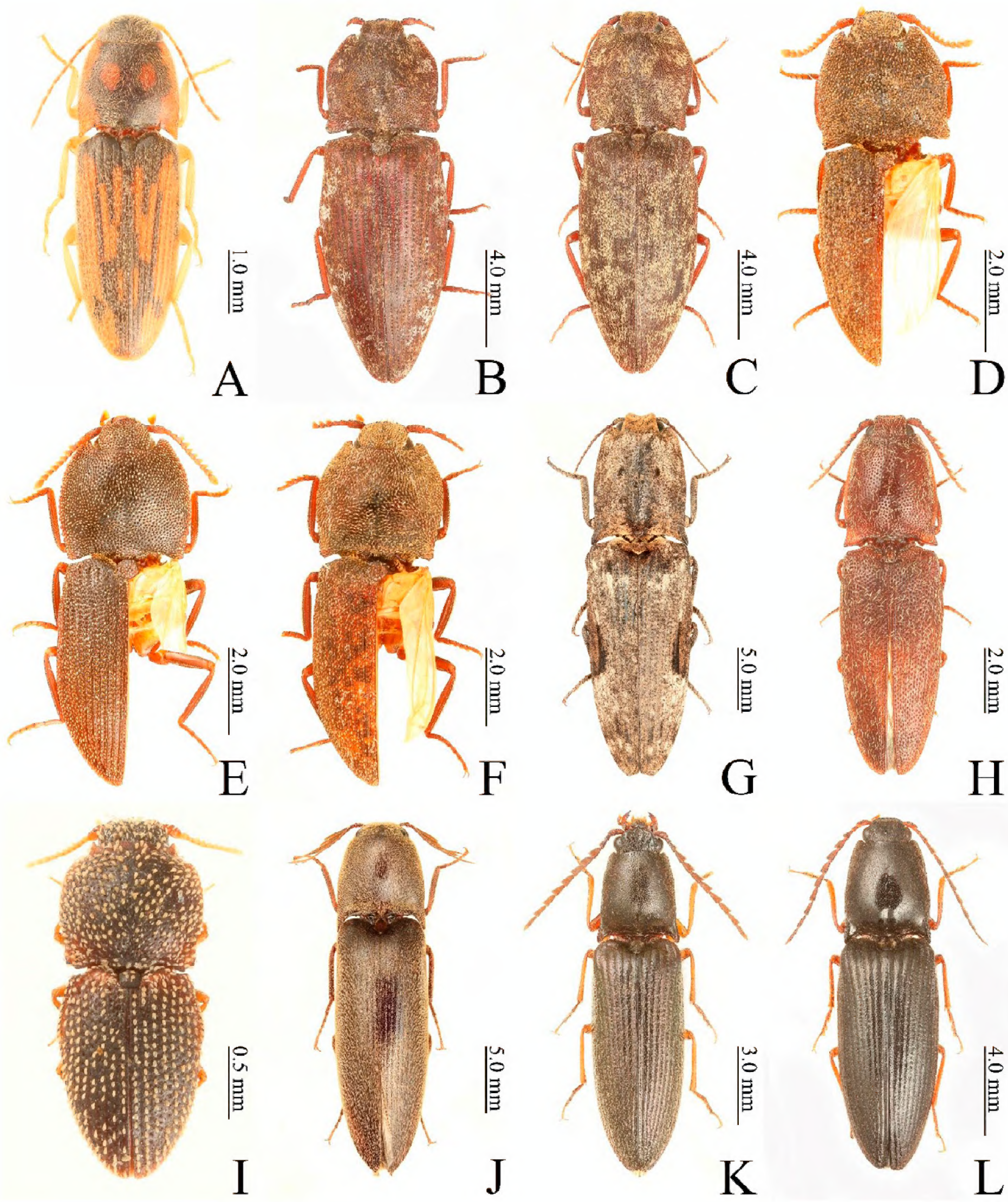

Figure 2. Elaterid species, habitus, dorsal view. **A.** *Aeoloderma brachmana*, male [21AeB01]. **B.** *Agrypnus* (*Agrypnus*) *binodulus binodulus*, female [21AB01]. **C.** *Agrypnus* (*Agrypnus*) *cordicollis*, male [21AC01]. **D.** *Agrypnus* (*Colaulon*) *kusuii*, female [21AK01]. **E.** *Agrypnus* (*Colaulon*) *miyamotoi miyamotoi*, male [21AM15]. **F.** *Agrypnus* (*Colaulon*) *miyamotoi miyamotoi*, male [21AM28]. **G.** *Cryptalaus larvatus pini*, male [21CL06]. **H.** *Lacon* (*Lacon*) *parallelus parallelus*, male [21LP01]. **I.** *Rismethus ryukyuensis*, female [21RY012]. **J.** *Tetrigus lewisi*, male [21TL01]. **K.** *Hemicrepidius* (*Hemicrepidius*) *desertor yakuensis*, male [21HDY01]. **L.** *Hemicrepidius* (*Hemicrepidius*) *secessus yakuanus*, male [21HSY01].

not reaching pronotum posterior lateral apices by apical antennomere; antennomeres IV–X serrate; prothorax not serrate laterally; pronotum shorter than wide, with a pair of tubercles; pronotosternal sutures deeply grooved and for reception of antennae; hind wings long; apices of parameres beyond preapical expansion shorter than wide.

Agrypnus (*Agrypnus*) *cordicollis* (Candèze, 1865)

Figure 2C

Lacon cordicollis Candèze 1865: 9.
Paralacon cordicollis—Ôhira 1954: 14.
Agrypnus cordicollis—Nakane and Kishii 1955d: 207.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Koseda (Site 11);

30.3831°N, 130.6244°E; 190 m alt.; 5.V.2019; K. Arimoto leg.; by SLT; 3♂ [21AC01–21AC03] • Kumage District, Yakushima Town, Kurio, Kuromi Forest Road (Site 22); 30.2914°N, 130.4424°E; 450 m alt.; 4.V.2017; K. Arimoto, R. Itô, R. Noda leg.; 1♂: by spraying; 2♂: by SLT; 3♂ [21AC04–21AC06].

Identification. Body length 14.5–16.3 mm; color blackish brown to reddish brown; body covered with intermixed brown and yellowish-white, scale-like setae; antennae not reaching pronotum posterior lateral apices by apical antennomere; antennomeres IV–X serrate; prothorax strongly serrate laterally; pronotum slightly longer than wide, with a pair of tubercles; pronotosternal sutures deeply grooved and for reception of antennae; hind wings long; apices of parameres beyond preapical expansion almost as long as wide or slightly longer than wide.

Agrypnus (*Colaulon*) *kusuii* Ôhira, 1993

Figure 2D

Agrypnus (*Colaulon*) *kusuii* Ôhira 1993: 249.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Anbô (Site 18); 30.3106°N, 130.6587°E; 5 m alt.; 3.V.2017; K. Arimoto, R. Itô, R. Noda leg.; in a crack in the foundation of a concrete building in grassland near a forest, by spraying; 1♀ [21AK01].

Identification. Body length 7.0 mm; color blackish brown; body covered with yellow, scale-like setae; antennae not reaching pronotum posterior lateral apices by apical antennomere; antennomeres IV–X serrate; prothorax slightly serrate laterally; hind angles of prothorax rather pointed; pronotum shorter than wide, without tubercles; pronotosternal sutures deeply grooved and for reception of antennae; hind wings extending beyond half of elytra length (Fig. 2D).

This species is endemic to the area around the Ôsumi Islands, including Cape Sata in Kyushu and Mage, Tanegashima, and Yaku islands (Ôhira 2004; Arimoto and Itô 2018).

Agrypnus (*Colaulon*) *miyamotoi miyamotoi* (Nakane & Kishii, 1955)

Figure 2E, F

Cryptolacon miyamotoi Nakane and Kishii 1955c: 2.
Colaulon (*Cryptolacon*) *miyamotoi*—Kishii 1964: 23.
Agrypnus miyamotoi—Hayek 1973: 183.
Agrypnus (*Colaulon*) *miyamotoi miyamotoi*—Ôhira and Irie 1977: 34.
Agrypnus (*Colaulon*) *miyamotoi yaku* Kishii 1996: 4.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Shitogo (Site 3); 30.4492°N, 130.5199°E; 5 m alt.; 4.V.2017; K. Arimoto, R. Itô, R. Noda leg.; grassland near the seaside (Fig. 6A), by spraying; 8♂2♀ [21AM01–21AM10] • Kumage District, Yakushima Town, Miyanoura (Site 5); 30.4236°N, 130.5777°E; 1 m alt.; 18.VII.2018; K. Arimoto leg.; sandy beach, by spraying; 1♂3♀ [21AM11–21AM14] • Kumage District, Yakushima Town, Miyanoura (Site 6); 30.4235°N, 130.5586°E; 20 m alt.; 13.VII.2017; K. Arimoto, R. Itô leg.; at streetlight; 6♂3♀ [21AM15–21AM23] • Kumage District, Yakushima Town, Nagata, Nagatainaka Beach (Site 7); 30.4099°N, 130.4357°E; 6 m alt.; 4.V.2017; K. Arimoto, R. Itô, R. Noda leg.; 1♀ [21AM24] • Kumage District, Yakushima Town, Koseda (Site 9); 30.4009°N, 130.6383°E; 5 m alt.; 18.VII.2018; K. Arimoto leg.; beach, by spraying; 1♀ [21AM25] • Kumage District, Yakushima Town, Anbô (Site 18); 30.3106°N, 130.6587°E; 5 m alt.; 3.V.2017; K. Arimoto, R. Itô, R. Noda leg.; in a crack in the foundation of a concrete building in grassland near a forest, by spraying; 1♂1♀ [21AM26, 21AM27] • Kumage District, Yakushima Town, Onoaida (Site 25); 30.2404°N, 130.5502°E; 90 m alt.; 5.V.2017; K. Arimoto, R. Itô, R. Noda leg.; by spraying; 1♂ [21AM28] • Kumage District, Yakushima Town, Yudomari (Site 26); 30.2347°N, 130.4754°E; 6 m alt.; 20.VII.2018; K. Arimoto leg.; sandy beach, by spraying; 4♂1♀ [21AM29–21AM33] • Kumage District, Yakushima Town, Kojima (Site 27); 30.2342°N, 130.5323°E; 4 m alt.; 3.V.2017; K. Arimoto, R. Itô, R. Noda leg.; sandy beach, by spraying; 1♀ [21AM34] • Kumage District, Yakushima Town, Kojima (Site 27); 30.2342°N, 130.5323°E; 4 m alt.; 20.VII.2018; K. Arimoto leg.; sandy beach, by spraying; 1♂ [21AM35] • Kumage District, Yakushima Town, Hirauchi (Site 28); 30.2334°N, 130.4970°E; 60 m alt.; 20.VII.2018; K. Arimoto leg.; by spraying; 2♂3♀ [21AM36–21AM40].

Identification. Body length 7.9–10.7 mm; body blackish brown to reddish brown, covered with yellow, scale-like setae; antennae not reaching pronotum posterior lateral apices by apical antennomere; antennomeres IV–X serrate; prothorax strongly serrate laterally; hind angles of prothorax not pointed; pronotum shorter than wide, without tubercles; pronotosternal sutures deeply grooved and for reception of antennae; hind wings not reaching or extending beyond half of elytra length; apices of parameres beyond preapical expansion longer than wide.

The species hind wings are short and recognized as degenerate. Ôhira (2004) reported that the hind wings are half the elytra length or less. The hind wings of the specimens examined were also less than half of the elytra length (Fig. 2E), except several specimens at Site 6, which were more than half of the elytra length (Fig. 2F).

Agrypnus (*Colaulon*) *miyamotoi yaku* had been treated as a subspecies endemic to Yaku Island (Kishii 1996, 1999). Ôhira (2004) synonymized it with *A.* (*C.*) *miyamotoi miyanotoi*, which Ôhira (2004) recognized as distributed on Yaku and Tokara islands.

Cryptalaus larvatus pini (Lewis, 1894)

Figure 2G

Alaus pini Lewis 1894: 30.
Alaus putridus pini—Nakane and Kishii 1955a: 15.
Paracalais larvatus pini—Ôhira 1976: 32.
Cryptalaus larvatus pini—Ôhira 1990b: 21.
Alaus putridus satoi Ôhira 1964: 235.

Paracalais putridus satoi—Ôhira 1969c: 25.
Paracalais larvatus satoi—Ôhira and Arimoto 1976: 365.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 18.VII.2018; K. Arimoto leg.; by SLT; 5♀ [21CL01–21CL05] • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 5.V.2019; K. Arimoto leg.; by SLT; 2♂ [21CL06, 21CL07] • Kumage District, Yakushima Town, Koseda (Site 12); 30.3737°N, 130.6260°E; 240 m alt.; 18.VII.2018; K. Arimoto leg.; by SLT (Fig. 6E); 2♀ [21CL08, 21CL09].

Identification. Body length 24.9–34.2 mm; body black, covered with intermixed orange, white, brown, and black scale-like setae; antennae not reaching pronotum posterior lateral apices by apical antennomere; antennomeres IV–X serrate; pronotum longer than wide, with a pair of circular markings of black setae; elytra with a pair of vertical stripes of black setae, emarginate apically.

Lacon (*Lacon*) *parallelus parallelus* (Lewis, 1894)

Figure 2H

Adelocera parallela Lewis 1894: 28.
Lacon parallelus—Fleutiaux 1926: 93.
Lacon (*Zalepia*) *parallelus*—Kishii 1966: 7.
Lacon (*Zalepia*) *parallelus parallelus*—Ôhira 1969c: 27.
Lacon parallelus parallelus—Satô 1975: 32
Lacon (*Adelocera*) *parallelus parallelus*—Suzuki 1983: 2
Lacon (*Lacon*) *parallelus*—Arimoto 1989: 14.
Lacon (*Lacon*) *parallelus parallelus*—Kishii 1987: 54.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Kurio, Kuromi Forest Road (Site 22); 30.2914°N, 130.4424°E; 450 m alt.; 4.V.2017; K. Arimoto, R. Itô, R. Noda leg.; by SLT; 2♂ [21LP01, 21LP02].

Identification. Body length 10.4–11.2 mm; body blackish brown to reddish brown, covered with yellow, scale-like setae; antennae not reaching pronotum posterior lateral apices by apical antennomere; antennomeres III–X serrate; pronotum longer than wide, without tubercles; pronotosternal sutures deeply grooved near procoxae and for reception of antennae; apices of parameres beyond preapical expansion longer than wide.

Rismethus ryukyuensis Ôhira, 1999

Figure 2I

Rismethus ryukyuensis Ôhira 1999d: 409.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Shitogo (Site 3); 30.4492°N, 130.5199°E; 5 m alt.; 4.V.2017; K. Arimoto, R. Itô, R. Noda leg.; found under a rock in grassland near the seaside (Fig. 6A, B) and by spraying; 11♂6♀ [21RY01–21RY17] • Kumage District, Yakushima Town, Nagata, Nagatainaka Beach (Site 7); 30.4099°N, 130.4357°E; 6 m alt.; 4.V.2017; K. Arimoto, R. Itô, R. Noda leg.; found on a sandy beach (Fig. 6C, D) and by spraying; 1♂ [21RY18].

Identification. Body length 2.0–2.8 mm; color black to brown, with antennae and legs reddish brown to yellow; body covered with brown, wide, scale-like setae; antennae not reaching pronotum posterior lateral apices by apical antennomere; antennomeres IV–X serrate; pronotum shorter than wide; pronotosternal sutures deeply grooved and for reception of antennae; hind wings short.

This species had been treated as *Rismethus scobinula* (Candèze, 1873) in Japan, but Ôhira (1999d) distinguished the Japanese species from *R. scobinula* by the smaller body, more rounded sides of pronotum, and more acutely pointed anterior angles of pronotum.

Tetrigus lewisi Candèze, 1873

Figure 2J

Tetrigus lewisi Candèze 1873: 6.
Tetrigus grandis Lewis 1879b: 155.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 18.VII.2018; K. Arimoto leg.; by SLT; 36♂ [21TL01–21TL36] • Kumage District, Yakushima Town, Koseda (Site 12); 30.3737°N, 130.6260°E; 240 m alt.; 18.VII.2018; K. Arimoto leg.; by SLT (Fig. 6E); 6♂1♀ [21TL37–21TL43] • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Site 14); 30.3882°N, 130.5713°E; 580 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by SLT; 2♂ [21TL44, 21TL45].

Identification. Body length 14.8–27.9 mm; color blackish brown; body covered with yellow setae; antennae not reaching pronotum posterior lateral apices by apical antennomere; antennomeres IV–X flabellate; pronotum longer than wide; elytra emarginate apically; apical outer edges of elytra strongly pointed; apices of parameres beyond preapical expansion shorter than wide.

Subfamily Dendrometerinae Gistel, 1848

Hemicrepidius (*Hemicrepidius*) *desertor yakuensis* Kishii, 1969

Figure 2K

Hemicrepidius (*Pseudathous*) *okadomei yakuensis* Kishii 1969: 3.
Hemicrepidius (*Heterathous*) *desertor* var. *rufoabdominalis* Nakane and Kishii 1958: 37.
Hemicrepidius (*Hemicrepidius*) *desertor yakuensis*—Kishii 1985: 10.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Sites 13–15); 30.3971°N, 130.5614°E–30.3833°N, 130.5727°E; 360–640 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by sweeping the flowers of trees during the day; 1♂ [21HDY01].

Identification. Body length 13.0 mm; color black, with antennae blackish orange, legs orange, elytra with copper luster, abdomen reddish brown but black in some; body covered with yellow setae; antennae extending beyond pronotum posterior lateral apices by apical two antennomeres in male, extending beyond pronotum posterior lateral apices by apical antennomere in female; antennomeres IV–X serrate; pronotum longer than wide;

tarsomeres I–III lamellate; apices of parameres beyond preapical expansion shorter than wide.

This subspecies is endemic to Yaku Island (Table 2).

Hemicrepidius (*Hemicrepidius*) *secessus yakuanus* Kishii, 2001

Figure 2L

Hemicrepidius (*Pseudathous*) *secessus* (Candèze 1873)—Nakane and Kishii 1958: 36.
Hemicrepidius (*Hemicrepidius*) *secessus yakuanus* Kishii 2001: 45.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Sites 13–15); 30.3971°N, 130.5614°E–30.3833°N, 130.5727°E; 360–640 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by sweeping the flowers of trees during the day; 1♂ [21HSY01].

Identification. Body length 15.8 mm; color black, with antennae blackish orange, legs red to orange, elytra without metallic luster; body covered with yellow setae; antennae extending beyond pronotum posterior lateral apices by apical antennomere in male, just reaching or not reaching pronotum posterior lateral apices by apical antennomere in female; antennomeres III–X serrate; pronotum longer than wide; tarsomeres II–III lamellate; apices of parameres beyond preapical expansion shorter than wide.

This subspecies is endemic to Yaku Island (Table 2).

Megathous suturalis (Candèze, 1873)

Figure 3A

Athous suturalis Candèze 1873: 23.
Megathous suturalis—Ôhira 2001a: 57.
Harminathous nakanei Kishii 1955: 79.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 18.VII.2018; K. Arimoto leg.; by looking at night; 1♂ [21MS01].

Identification. Body length 17.6 mm; color black to brown, with legs brown; body covered with yellow setae; antennae extending beyond pronotum posterior lateral apices by apical antennomere in male, not reaching pronotum posterior lateral apices by apical antennomere in female; antennomeres III–X serrate; pronotum longer than wide; tarsomeres II–IV lamellate.

Neopristilophus serrifer yakuanus Kishii, 1982

Figure 3B

Neopristilophus serrifer (Candèze 1873)—Kishii 1959: 6.
Neopristilophus serrifer yakuanus Kishii 1982: 40

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 18.VII.2018; K. Arimoto leg.; by SLT; 1♂1♀ [21NSY01, 21NSY02].

Identification. Body length 15.0–15.5 mm; color black, with antennae and legs red; body covered with yellow setae; antennae extending beyond pronotum posterior lateral apices by apical antennomere in male, antennae not reaching pronotum posterior lateral apices by apical antennomere in female; antennomeres IV–X serrate; pronotum longer than wide; median longitudinal depression of pronotum deep, reaching near pronotum anterior margin; parameres rounded apically.

This subspecies is endemic to Yaku Island (Table 2).

Stenagostus umbratilis (Lewis, 1894)

Figure 3C

Athous umbratilis Lewis 1894: 198.
Stenagostus umbratilis—Nakane and Kishii 1955a: 15.
Stenagostus umbratilis var. *obscuratus* Nakane 1958: 86.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Site 14); 30.3882°N, 130.5713°E; 580 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by SLT; 1♀ [21SU01] • Kumage District, Yakushima Town, Anbô, along Prefectural Route 592 (Site 17); 30.3151°N, 130.6030°E; 630 m alt.; 19.VII.2018; K. Arimoto leg.; by SLT; 1♀ [21SU02].

Identification. Body length 17.9–20.3 mm; color black to reddish brown; body covered with yellow and black setae; antennae extending pronotum posterior lateral apices by apical antennomere in male, not reaching pronotum posterior lateral apices by apical antennomere in female; antennomeres with median longitudinal carina, III–X serrate; pronotum slightly shorter than wide; elytra with four horizontal strips of black setae; tarsomere I with short lobe, II–IV lamellate.

Subfamily Elaterinae Leach, 1815

Agaripenthes helvolus (Candèze, 1873)

Figure 3D

Agriotes helvolus Candèze 1873: 30.
Procraerus helvolus—Nakane and Kishii 1958: 37.
Procraerus (*Agaripenthes*) *helvolus*—Ôhira, 1970b: 84.
Agaripenthes helvolus—Gurjeva 1979: 115.
Megapenthes flavus Fleutiaux 1902: 19.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Site 14); 30.3882°N, 130.5713°E; 580 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by SLT; 1♀ [21AH01] • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Sites 13–15); 30.3971°N, 130.5614°E–30.3833°N, 130.5727°E; 360–640 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by sweeping the flowers of trees during the day; 6♂4♀ [21AH02–21AH11].

Identification. Body length 3.3–4.2 mm; color orange, with head black, antennae and legs orange; body covered with yellow setae; antennae extending beyond pronotum posterior lateral apices by apical two or three antennomeres in male, antennae not reaching pronotum posterior lateral apices by apical antennomere in female; antennomeres with median longitudinal carina, IV–X serrate; pronotum almost as long as wide; hind angles of pronotum unicarinate; apices of parameres beyond preapical expansion longer than wide.

Table 2. Checklist of species in the family Elateridae from Yaku Island, Japan. Dagger (†), Yaku Island is the southern limit of the species distribution; minus (–), Yaku Island is the northern limit of the species distribution; asterisk (*), species endemic to Yaku Island; hash (#), subspecies endemic to Yaku Island; and section (§), subspecies shared with the elaterid fauna of the neighboring island in the Ôsumi Islands.

No.	Species name	Remarks
1	*Pectocera fortunei yakuana* Kishii, 1993	†, #
2	*Adelocera brunneus* (Lewis, 1894)	
3	*Adelocera difficilis* (Lewis, 1894)	
4	*Aeoloderma brachmana* (Candèze, 1859)	
5	*Agrypnus* (*Agrypnus*) *binodulus binodulus* (Motschulsky, 1861)	†
6	*Agrypnus* (*Agrypnus*) *cordicollis* (Candèze, 1865)	†
7	*Agrypnus* (*Colaulon*) *kusuii* Ôhira, 1993	
8	*Agrypnus* (*Colaulon*) *miyamotoi miyanotoi* (Nakane & Kishii, 1955)	
9	*Agrypnus* (*Colaulon*) *tsukamotoi* (Kishii, 1956)	†
10	*Agrypnus* (*Sabikikorius*) *fuliginosus* (Candèze, 1865)	†
11	*Agrypnus* (*Sagojyo*) *yuppe* (Kishii, 1964)	
12	*Babadrasterius urabensis* Ôhira, 1994	–
13	*Cryptalaus berus* (Candèze, 1865)	
14	*Cryptalaus larvatus pini* (Lewis, 1894)	
15	*Lacon* (*Alaotypus*) *maeklini*i (Candèze, 1865)	†
16	*Lacon* (*Lacon*) *parallelus parallelus* (Lewis, 1894)	
17	*Nanseia erabuensis* (Kishii, 1966)	
18	*Prodrasterius agnates* (Candèze, 1873)	
19	*Rismethus ryukyuensis* Ôhira, 1999	
20	*Tetrigus lewisi* Candèze, 1873	
21	*Actenicerus aerosus miyanouranus* (Kishii, 1968)	†, #
22	*Actenicerus yaku* Nakane & Kishii, 1958	*
23	*Corymbitodes gratus* (Lewis,1894)	†
24	*Hemicrepidius* (*Hemicrepidius*) *desertor yakuensis* Kishii, 1969	#
25	*Hemicrepidius* (*Hemicrepidius*) *secessus yakuanus* Kishii, 2001	#
26	*Hemicrepidius* (*Hemicrepidius*) *sinuatus satouchii* Kishii, 1961	†, #
27	*Homotechnes ogatai* (Kishii, 1983)	*
28	*Ischiodontus kawaii* Ôhira, 1967	
29	*Megapenthes opacus* Candèze, 1873	†
30	*Megathous suturalis* (Candèze, 1873)	†
31	*Neopristilophus serrifer yakuanus* Kishii, 1982	†, #
32	*Paraphotistus notabilis yagi* Kishii, 1982	†, §
33	*Scutellathous yakuensis* Nakane & Kishii, 1958	*
34	*Stenagostus umbratilis* (Lewis, 1894)	†
35	*Abelater shirozui* (Kishii, 1959)	–
36	*Agaripenthes helvolus* (Candèze, 1873)	†
37	*Agaripenthes shibatai* (Kishii, 1969)	*
38	*Agaripenthes yakuensis* Arimoto, 2011	*
39	*Ampedus* (*Ampedus*) *hypogastricus kosugi* Kishii, 1982	†, #
40	*Ampedus* (*Ampedus*) *japonicus kosugiensis* Kishii, 1983	
41	*Ampedus* (*Ampedus*) *kasugensis yakushimensis* Kishii, 1983	†, #
42	*Ampedus* (*Ampedus*) *ogatai* Kishii, 1983	*
43	*Ampedus* (*Ampedus*) *sawadai* Kishii, 1985	*
44	*Ampedus* (*Ampedus*) *tenuistriatus insulicola* Kishii, 2010	†, #
45	*Ampedus* (*Ampedus*) *vestitus yakuinsulanus* Kishii, 1983	
46	*Ampedus* (*Ampedus*) *yaku yaku* Kishii, 1969	†, #
47	*Ampedus* (*Ampedus*) *yakuensis* Kishii, 1976	*
48	*Ampedus* (*Miwaelater*) *niponicus* (Lewis, 1894)	†
49	*Dalopius yakuensis* Kishii, 1975	*
50	*Ectamenogonus plebejus* (Candèze, 1873)	
51	*Ectinoides insignitus ogatai* Kishii, 1986	†, #
52	*Ectinus higonius* (Lewis, 1894)	†
53	*Glyphonyx bicolor yaku* Kishii, 1976	†, #
54	*Glyphonyx kurosawai* Nakake & Kishii, 1958	*
55	*Glyphonyx uedai uedai* Kishii, 1977	†, #
56	*Haterumelater bicarinatus yaku* Kishii, 1976	
57	*Hayekpenthes pallidus pallidus* (Lewis, 1894)	
58	*Kometsukia vesticornis* Kishii, 1957	†
59	*Megapenthes shirozui shirozui* Kishii, 1959	†, #
60	*Melanotus* (*Melanotus*) *correctus issikii* Miwa, 1929	†, §
61	*Melanotus* (*Melanotus*) *erythropygus erythropygus* Candèze, 1873	†
62	*Melanotus* (*Melanotus*) *legatoides* Kishii, 1975	†
63	*Melanotus* (*Melanotus*) *legatus ogatai* Kishii, 1988	
64	*Melanotus* (*Melanotus*) *lewisi lewisi* Schenkling, 1927	
65	*Melanotus* (*Melanotus*) *satoi* Ôhira, 1967	
66	*Melanotus* (*Melanotus*) *senilis yakuinsulanus* Kishii, 1986	†, §
67	*Melanotus* (*Melanotus*) *spernendus kosugi* Kishii, 1975	†, #
68	*Melanotus* (*Spheniscosomus*) *cete cete* Candèze, 1860	
69	*Mulsanteus junior yakuensis* (Kishii, 1983)	†, #
70	*Mulsanteus linteatus linteatus* (Candèze, 1873)	
71	*Nipponoelater sieboldi sieboldi* (Candèze, 1873)	
72	*Parasilesis musculus yaku* (Kishii, 1976)	†, #
73	*Podeonius aquilus ryukyuensis* (Ôhira, 1968)	
74	*Suzukielater babai* (Kishii & Ohira, 1956)	†
75	*Vuilletus elongates* (Nakane & Kishii, 1958)	*
76	*Fleutiauxellus* (*Migiwa*) *curates curates* (Candèze, 1873)	†
77	*Miquasus luteipes* (Candèze, 1873)	†
78	*Miquasus ohkurai* Ôhira, 1992	*
79	*Quasimus satoi kimurai* Kishii, 1970	–, #
80	*Quasimus shibatai shibatai* Kishii, 1970	–
81	*Quasimus yakuensis* Kishii, 1959	*
82	*Quasimus yasuii* Kishii, 1970	†
83	*Yukoana carinicollis* (Lewis, 1894)	†
84	*Yukoana elliptica* (Candeze, 1873)	†
85	*Yukoana elongata elongata* Kishii, 1970	–
86	*Yukoana monticola* Kishii, 1961	*
87	*Yukoana tamui* Kishii, 1959	†
88	*Zorochros* (*Pronegastrius*) *humeralis yakuensis* (Kishii, 1976)	†, §
89	*Zorochros* (*Yamatostrius*) *osawai* (Ôhira, 1972)	†
90	*Displatynychus adjutor* (Candèze, 1873)	†
91	*Paracardiophorus nakanei nakanei* Ôhira, 1986	†, §
92	*Paracardiophorus pullatus pullatus* (Candèze, 1873)	†
93	*Paracardiophorus sequens purpuratus* Kishii, 1977	†, #
94	*Paracardiophorus tokara yakuensis* Ôhira, 1970	–, #
95	*Platynychus nothus* (Candèze, 1865)	†

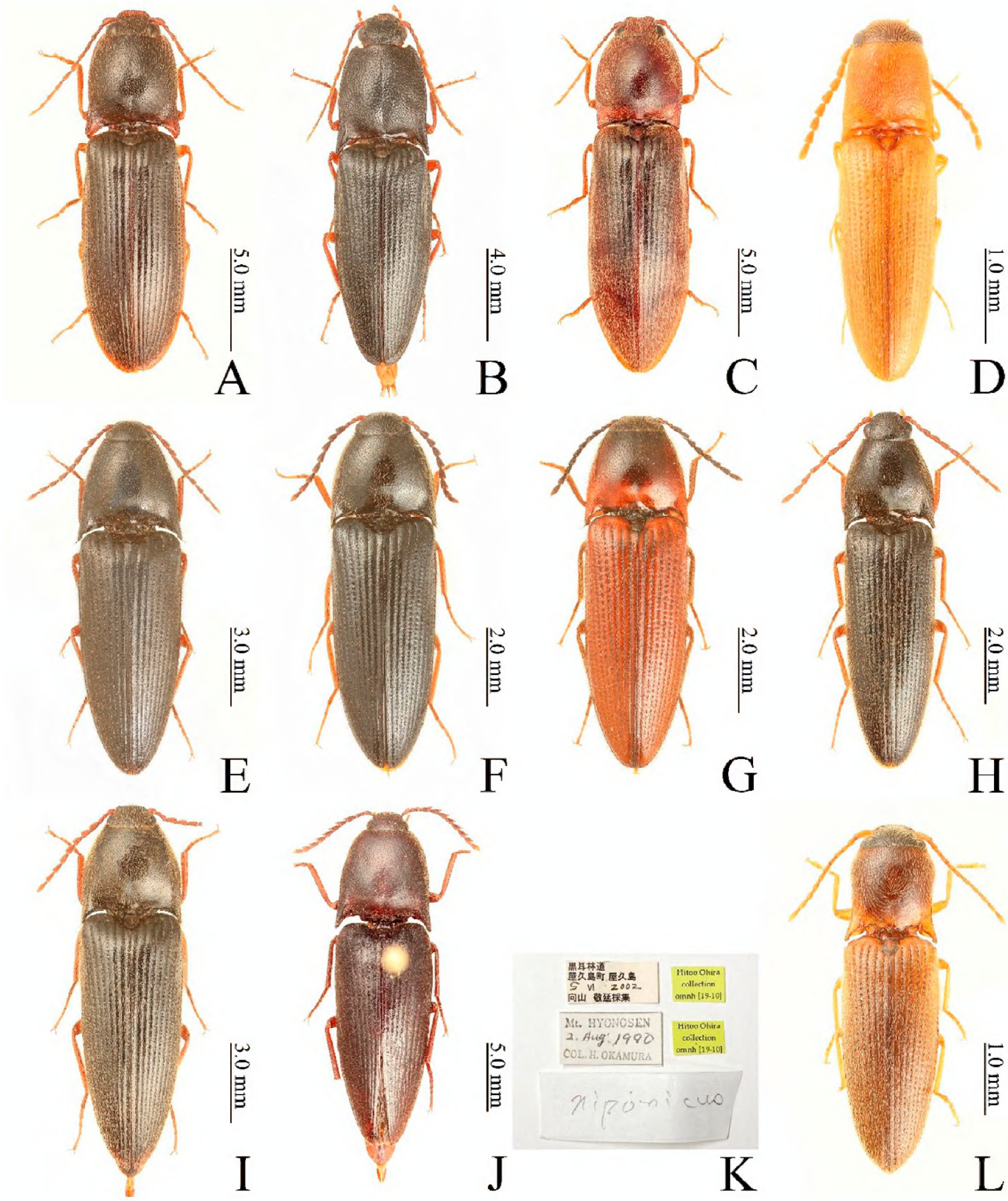

Figure 3. Elaterid species, habitus, dorsal view and labels. **A.** *Megathous suturalis*, male [21MS01]. **B.** *Neopristilophus serrifer yakuanus*, male [21NSY01]. **C.** *Stenagostus umbratilis*, female [21SU01]. **D.** *Agaripenthes helvolus*, male [21AH02]. **E.** *Ampedus* (*Ampedus*) *hypogastricus kosugi*, male [21AHK01]. **F.** *Ampedus* (*Ampedus*) *japonicus kosugiensis*, male [21AJK10]. **G.** *Ampedus* (*Ampedus*) *japonicus kosugiensis*, male [21AJK08]. **H.** *Ampedus* (*Ampedus*) *ogatai*, male [21AO01]. **I.** *Ampedus* (*Ampedus*) *vestitus yakuinsulanus*, female [21AVY01]. **J.** *Elater niponensis*, male. **K.** labels of *Elater niponensis*. **L.** *Glyphonyx bicolor yaku*, male [21GBY02].

Ôhira (1970b) established *Agaripenthes* as a subgenus of the genus *Procraerus* Reitter, 1905. Gurjeva (1979) raised the subgenus to generic status. Kishii (1999, 2006) and Arimoto (2011) followed treatment of Gurjeva (1979). The status of *Agaripenthes* is not stable. This study follows Gurjeva (1979).

Ampedus (*Ampedus*) *hypogastricus kosugi* Kishii, 1982

Figure 3E

Ampedus (*Ampedus*) *hypogastricus*—Nakane and Kishii 1958: 37.
Ampedus (*Ampedus*) *hypogastricus kosugi* Kishii 1982: 46.

Material examined. JAPAN – **Kagoshima Prefecture**

• Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 5.V.2019; K. Arimoto leg.; by SLT; 2♂ [21AHK01, 21AHK02] • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Site 14); 30.3882°N, 130.5713°E; 580 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by SLT; 1♂1♀ [21AHK03, 21AHK04].

Identification. Body length 13.0–13.6 mm; color black, with antennae and legs reddish brown, pronotum with weak opal luster, abdomen red but black in some; body covered with brown to black setae; antennae not reaching pronotum posterior lateral apices by apical antennomere; antennomeres IV–X serrate; pronotum shorter than wide; hind angles of pronotum unicarinate; apices of parameres beyond preapical expansion longer than wide.

This subspecies is endemic to Yaku Island (Table 2).

Ampedus (*Ampedus*) *japonicus kosugiensis* Kishii, 1983

Figure 3F, G

Ampedus (*Ampedus*) *rufipes* (Lewis, 1894)—Nakane and Kishii 1958: 37.
Ampedus (*Ampedus*) *japonicus kosugiensis* Kishii 1983a: 33.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Issô (Site 1); 30.4584°N, 130.4999°E; 30 m alt.; 4.V.2017; K. Arimoto, R. Itô, R. Noda leg.; by sweeping the flowers of *Castanopsis sieboldii* (Makino) Hatus. Ex T. Yamaz. et Mashiba during the day; 4♂3♀ [21AJK01–21AJK07] • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 5.V.2019; K. Arimoto leg.; by SLT; 2♀ [21AJK08, 21AJK09] • Kumage District, Yakushima Town, Kurio, Kuromi Forest Road (Site 23); 30.2913°N, 130.4401°E; 430 m alt.; 5.V.2017; K. Arimoto, R. Itô, R. Noda leg.; by sweeping the flowers of *C. sieboldii* during the day; 10♂5♀ [21AJK10–21AJK24].

Identification. Body length 7.4–9.0 mm; color black, with antennae blackish but antennomeres I–III orange, legs orange; body covered with yellow setae; antennae not reaching pronotum posterior lateral apices by apical antennomere; antennomeres IV–X serrate; pronotum shorter than wide; hind angles of pronotum unicarinate; apices of parameres beyond preapical expansion slightly longer than wide or almost as long as wide.

The species usually has a black body (Fig. 3F), but the body of the examined specimen [21AJK08] was completely reddish (Fig. 3G).

This subspecies is endemic to Yaku and Nakanoshima islands (Kishii, 1999).

Ampedus (*Ampedus*) *ogatai* Kishii, 1983

Figure 3H

Ampedus (*Ampedus*) *ogatai* Kishii 1983a: 33.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Mugio, along Prefectural Route 592 (Site 21); 30.2959°N, 130.5660°E; 1180 m alt.; 6.V.2017; K. Arimoto, R. Itô, R. Noda leg.; from under the bark of *Cryptomeria japonica*, by spraying; 1♂ [21AO01].

Identification. Body length 9.4 mm; color black, with antennae and legs orange; body covered with yellow setae; antennae just reaching pronotum posterior lateral apices by apical antennomere; antennomeres IV–X serrate; pronotum almost as long as wide; hind angles of pronotum unicarinate; apices of parameres beyond preapical expansion longer than wide. Female unknown.

This species is recorded for the first time since its original description. The male holotype was found at around 1,300 m above sea level on Yaku Island. The specimen examined here was collected at 1,180 m. This species is thought to be endemic to highlands of Yaku Island.

Ampedus (*Ampedus*) *vestitus yakuinsulanus* Kishii, 1983

Figure 3I

Ampedus (*Ampedus*) *vestitus yakuensis* Kishii 1979: 7; a homonym of *Ampedus* (*Ampedus*) *yakuensis* Kishii, 1976.
Ampedus (*Ampedus*) *vestitus yakuinsulanus* Kishii 1983b: 53.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Kurio, Kuromi Forest Road (Site 23); 30.2913°N, 130.4401°E; 430 m alt.; 5.V.2017; K. Arimoto, R. Itô, R. Noda leg.; by sweeping the flowers of *Castanopsis sieboldii* during the day; 1♀ [21AVY01].

Identification. Body length 13.7 mm; color black, with antennae and legs orange, elytral apices red; body covered with yellow setae; antennae not reaching pronotum posterior lateral apices by apical antennomere; antennomeres IV–X serrate; pronotum almost as long as wide; hind angles of pronotum unicarinate. Male of the subspecies unknown.

This subspecies is endemic to Yaku and Nakanoshima islands (Kishii 1999).

Elater niponensis (Lewis, 1894)

Figure 3J, K

Ludius niponensis Lewis 1894: 264.
Elater niponensis—Gurjeva 1979: 289.

Material examined. Upper label data: JAPAN – **Kagoshima Prefecture** • Kumage District, Kuromi Forest Road; 5. VI. 2002; Takanobu Sakiyama leg.; lower label data: JAPAN – Mt. Hyônosen (between Tottori and Hyôgo Prefectures); 2. VIII. 1990; H. Okamura leg.; 1♀ [21EN01].

Identification. Body length 24.2 mm; color black, with antennae and legs black to blackish orange; body covered with black to brown setae; antennae not reaching pronotum posterior lateral apices by apical antennomere; antennomeres IV–X serrate; pronotum longer than wide; hind angles of pronotum unicarinate.

Glyphonyx bicolor yaku Kishii, 1976

Figure 3L

Glyphonyx bicolor yaku Kishii 1976a: 13.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 18.VII.2018; K. Arimoto leg.; by SLT; 1♀ [21GBY01] • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Sites 13–15); 30.3971°N, 130.5614°E–30.3833°N, 130.5727°E; 360–640 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by sweeping the flowers of trees during the day; 1♂ [21GBY02].

Identification. Body length 4.8–5.2 mm; color blackish orange to brown, partly paler, with antennae and legs orange to yellow; body covered with yellow setae; supra-antennal carina V-shaped; antennae extending beyond pronotum posterior lateral apices by apical antennomere in male, just reaching or not reaching pronotum posterior lateral apices by apical antennomere in male; antennomere II longer than III; antennomeres IV–X serrate; pronotum longer than wide; tarsomere IV lamellate; claws pectinate.

This subspecies is endemic to Yaku Island (Table 2).

Glyphonyx kurosawai Nakane & Kishii, 1958

Figure 4A

Glyphonyx kurosawai Nakane and Kishii 1958: 39.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 18.VII.2018; K. Arimoto leg.; by SLT; 4♂2♀[21GK01–21GK06].

Identification. Body length 5.3–7.2 mm; color blackish brown, partly orange to brown, with antennae and legs orange to yellow; body covered with yellow setae; supra-antennal carina V-shaped; antennae extending beyond pronotum posterior lateral apices by apical antennomere in male, just reaching or not reaching pronotum posterior lateral apices by apical antennomere in female; antennomere II longer than III; antennomeres IV–X serrate; pronotum longer than wide; tarsomere IV lamellate; claws pectinate.

This species is endemic to Yaku Island (Table 2). Ohira (1970a, 1996a) recorded *Glyphonyx uedai uedai* and described the morphology, but the specimens were a misidentification of *Glyphonyx kurosawai*.

Glyphonyx uedai uedai Kishii, 1977

Figure 4B

Glyphonyx uedai uedai Kishii 1977: 50.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Sites 13–15); 30.3971°N, 130.5614°E–30.3833°N, 130.5727°E; 360–640 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by sweeping the flowers of trees during the day; 1♀ [21GU01].

Identification. Body length 5.2 mm; color blackish brown, partly orange to brown, with antennae and legs orange to yellow; body covered with yellow setae; supra-antennal carina V-shaped; antennae extending beyond pronotum posterior lateral apices by apical antennomere in male, just reaching or not reaching pronotum posterior lateral apices by apical antennomere in female; antennomere II longer than III; antennomeres IV–X serrate; pronotum almost as long as wide; tarsomere IV lamellate; claws pectinate.

This subspecies is endemic to Yaku Island (Table 2).

Haterumelater bicarinatus yaku Kishii, 1976

Figure 4C

Ectamenogonus? *bicarinatus* (Candèze 1873)—Nakane and Kishii 1958: 38.

Haterumelater bicarinatus yaku Kishii 1976a: 49.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 18.VII.2018; K. Arimoto leg.; by SLT; 4♂ [21HBY01–21HBY04].

Identification. Body length 10.0–11.3 mm; color blackish brown to brown, with antennae and legs reddish brown; body covered with yellow to brown setae; antennae extending beyond pronotum posterior lateral apices by apical antennomere in male, not reaching pronotum posterior lateral apices by apical antennomere in female; antennomeres III–X serrate; pronotum longer than wide, strongly narrowed anteriad; hind angles of pronotum bicarinate; apices of parameres beyond preapical expansion shorter than wide.

This subspecies is endemic to Tanegashima and Yaku islands, and the Tokara Islands (Ôhira 2005).

Hayekpenthes pallidus pallidus (Lewis, 1894)

Figure 4D

Megapenthes pallidus Lewis 1894: 46.
Pengamethes pallidus—Miwa 1933: 70.
Ganoxanthus pallidus—Nakane and Kishii 1955d: 208.
Hayekpenthes pallidus—Ôhira 1970b: 87.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 18.VII.2018; K. Arimoto leg.; by SLT; 2♂5♀ [21HP01–21HP07] • Kumage District, Yakushima Town, Koseda (Site 12); 30.3737°N, 130.6260°E; 240 m alt.; 18.VII.2018; K. Arimoto leg.; by SLT (Fig. 6E); 1♀ [21HP08] • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Site 14); 30.3882°N, 130.5713°E; 580 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by SLT; 2♀ [21HP09, 21HP10] • Kumage District, Yakushima Town, Anbô, along Prefectural Route 592 (Site 17); 30.3151°N, 130.6030°E; 630 m alt.; 19.VII.2018; K. Arimoto leg.; by SLT; 1♀ [21HP11].

Identification. Body length 6.6–9.8 mm; color orange; body covered with yellow setae; antennae extending beyond pronotum posterior lateral apices by apical three antennomeres in male, antennae just reaching or not reaching pronotum posterior lateral apices by apical antennomere in female; antennomeres with median

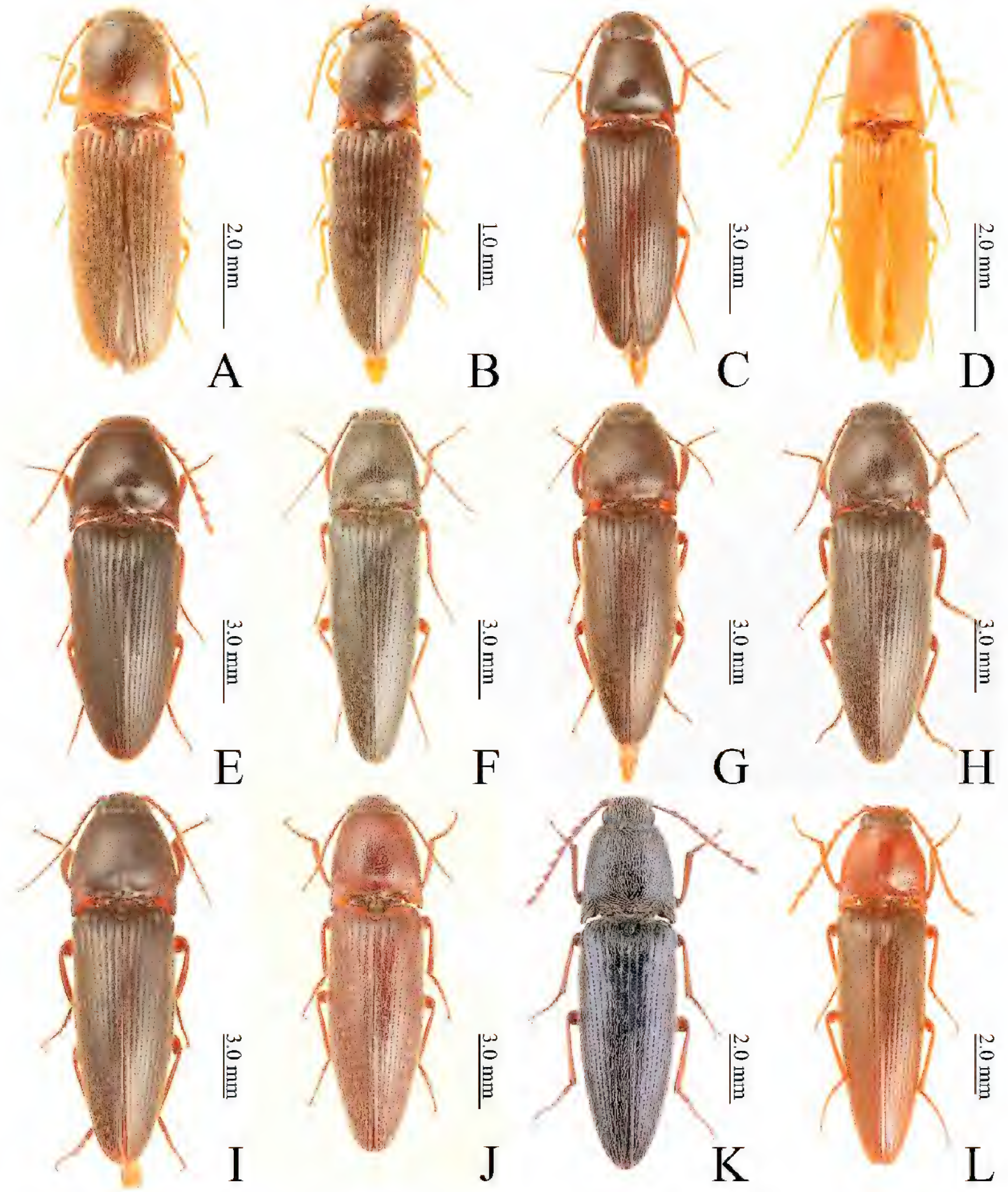

Figure 4. Elaterid species, habitus, dorsal view. **A.** *Glyphonyx kurosawai*, male [21GK01]. **B.** *Glyphonyx uedai uedai*, female [21GU01]. **C.** *Haterumelater bicarinatus yaku*, male [21HBY01]. **D.** *Hayekpenthes pallidus pallidus*, female [21HP01]. **E.** *Kometsukia vesticornis*, male [21KV02]. **F.** *Melanotus* (*Melanotus*) *correctus issikii*, male [21MCI01]. **G.** *Melanotus* (*Melanotus*) *legatoides*, male [21ML01]. **H.** *Melanotus* (*Melanotus*) *legatus ogatai*, male [21MLO19]. **I.** *Melanotus* (*Melanotus*) *lewisi lewisi*, male [21MLL01]. **J.** *Melanotus* (*Melanotus*) *satoi*, female [21MS02]. **K.** *Melanotus* (*Melanotus*) *senilis yakuinsulanus*, female [21MSY01]. **L.** *Melanotus* (*Melanotus*) *spernendus kosugi*, male [21MSK01].

longitudinal carina, III–X serrate; pronotum longer than wide; hind angles of pronotum unicarinate; elytra emarginate apically; apices of parameres beyond preapical expansion longer than wide.

Kometsukia vesticornis Kishii, 1957

Figure 4E

Kometsukia vesticornis Kishii 1957: 11.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 18.VII.2018; K. Arimoto leg.; by SLT; 1♀ [21KV01] • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Site 14); 30.3882°N, 130.5713°E; 580

m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by SLT; 1♂ [21KV02].

Identification. Body length 12.5–13.4 mm; color blackish brown to brown, with antennae and legs reddish brown; body covered with yellow to brown setae; antennae extending beyond pronotum posterior lateral apices by apical antennomere in male, not reaching pronotum posterior lateral apices by apical antennomere in female; antennomeres IV–X serrate; antennomere IV longer than II–III combined; pronotum shorter than wide; hind angles of pronotum bicarinate; apices of parameres beyond preapical expansion longer than wide.

Melanotus (*Melanotus*) *correctus issikii* Miwa, 1929

Figure 4F

Melanotus issikii Miwa 1929: 346.
Melanotus correctus issikii—Nakane and Kishii 1958: 38.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 5.V.2019; K. Arimoto leg.; 7♂1♀: by SLT; 3♂: by sweeping; 10♂1♀ [21MCI01–21MCI11] • Kumage District, Yakushima Town, Kurio, Kuromi Forest Road (Site 22); 30.2914°N, 130.4424°E; 450 m alt.; 4.V.2017; K. Arimoto, R. Itô, R. Noda leg.; by SLT; 2♂ [21MCI12, 21MCI13].

Identification. Body length 11.5–15.2 mm; color greyish black, with antennae and legs reddish brown, abdomen red to reddish brown; body covered with yellowish-white setae; antennae extending beyond pronotum posterior lateral apices by apical two antennomeres in male, not reaching pronotum posterior lateral apices by apical antennomere in female; antennomeres IV–X serrate; pronotum almost as long as wide; prosternal process inclined in profile; claws pectinate; apices of parameres beyond preapical expansion longer than wide; bursa copulatrix wide and cylindrical; long sac extending from bursa copulatrix, without sclerotized spines.

This subspecies is endemic to Yaku and Kuchinoerabu islands (Table 2). Kishii (2006) stated that this subspecies should be raised to a species.

Melanotus (*Melanotus*) *legatoides* Kishii, 1975

Figure 4G

Melanotus (*Melanotus*) *legatoides* Kishii 1975: 5.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 18.VII.2018; K. Arimoto leg.; by SLT; 1♂2♀ [21ML01–21ML03].

Identification. Body length 14.5–16.4 mm; color blackish brown, with antennae and legs reddish brown; body covered with yellow setae; antennae not reaching pronotum posterior lateral apices by apical antennomere; antennomeres IV–X serrate; pronotum almost as long as wide; prosternal process inclined in profile; claws pectinate; apices of parameres beyond preapical expansion shorter than wide; bursa copulatrix elongate and cylindrical; long sac extending from bursa copulatrix, without sclerotized spines.

Melanotus (*Melanotus*) *legatus ogatai* Kishii, 1988

Figure 4H

Melanotus legatus Candèze 1860—Nakane and Kishii 1958: 38.
Melanotus (*Melanotus*) *legatus ogatai* Kishii 1988: 124.
Melanotus (*Melanotus*) *akusekianus* Ôhira 1997d: 346.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Nagata, near Nagatainaka Beach (Site 8); 30.4097°N, 130.4360°E; 10 m alt.; 13.VII.2017; K. Arimoto, R. Itô leg.; at streetlight; 1♀ [21MLO01] • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 18.VII.2018; K. Arimoto leg.; by SLT; 1♂9♀ [21MLO02–21MLO11] • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 5.V.2019; K. Arimoto leg.; by SLT; 4♂ [21MLO12–21MLO15] • Kumage District, Yakushima Town, Koseda (Site 12); 30.3737°N, 130.6260°E; 240 m alt.; 18.VII.2018; K. Arimoto leg.; by SLT (Fig. 6E); 1♀ [21MLO16] • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Site 14); 30.3882°N, 130.5713°E; 580 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by SLT; 6♂2♀ [21MLG17–21MLG24] • Kumage District, Yakushima Town, Funayuki (Site 16); 30.3408°N, 130.6502°E; 170 m alt.; 6.V.2019; K. Arimoto leg.; by SLT; 2♀ [21MLG25, 21MLG26] • Kumage District, Yakushima Town, Kurio, Kuromi Forest Road (Site 22); 30.2914°N, 130.4424°E; 450 m alt.; 4.V.2017; K. Arimoto, R. Itô, R. Noda leg.; by SLT; 6♂2♀ [21MLO27–21MLO34] • Kumage District, Yakushima Town, Kurio, Kurio Beach (Site 24); 30.2671°N, 130.4222°E; 6 m alt.; 3.V.2017; K. Arimoto, R. Itô, R. Noda leg.; 1♂ [21MLO35].

Identification. Body length 13.9–17.3 mm; color blackish brown, with antennae and legs reddish brown; body covered with yellow setae; antennae extending beyond pronotum posterior lateral apices by apical antennomere in male, not reaching pronotum posterior lateral apices by apical antennomere in female; antennomeres IV–X serrate; pronotum longer than wide; prosternal process inclined in profile; claws pectinate; apices of parameres beyond preapical expansion longer than wide; bursa copulatrix short and conical; long sac extending from bursa copulatrix, without sclerotized spines.

This subspecies is endemic to the **Ôsumi and Tokara** archipelagos (Kishii 1999).

Melanotus (*Melanotus*) *lewisi lewisi* Schenkling, 1927

Figure 4I

Melanotus longipennis Lewis 1894: 192; a homonym of *Cratonychus longipennis* Küster, 1848.
Melanotus lewisi Schenkling 1927: 277.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 18.VII.2018; K. Arimoto leg.; by SLT; 16♂4♀ [21MLL01–21MLL20] • Kumage District, Yakushima Town, Koseda (Site 12);

30.3737°N, 130.6260°E; 240 m alt.; 18.VII.2018; K. Arimoto leg.; by SLT (Fig. 6E); 1♂ [21MLL21] • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Site 14); 30.3882°N, 130.5713°E; 580 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by SLT; 7♂ [21MLL22–21MLL28].

Identification. Body length 17.1–20.9 mm; color blackish brown, partly reddish, with antennae and legs reddish brown; body covered with brown setae; antennae just reaching or extending beyond pronotum posterior lateral apices by apical antennomere in male, not reaching pronotum posterior lateral apices by apical antennomere in female; antennomeres IV–X serrate; pronotum shorter than wide; pronotum dully shining; prosternal process inclined in profile; claws pectinate; apices of parameres beyond preapical expansion longer than wide; bursa copulatrix short and conical; long sac extending from bursa copulatrix, without sclerotized spines.

Melanotus (*Melanotus*) *satoi* Ôhira, 1967

Figure 4J

Melanotus loochooensis Miwa 1929—Nakane and Kishii 1958: 38.
Melanotus (*Melanotus*) *loochooensis satoi* Ôhira 1967: 35.
Melanotus (*Melanotus*) *satoi*—Ôhira 1982: 21.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Yoshida (Site 4); 30.4329°N, 130.4618°E; 20 m alt.; 13.VII.2017; K. Arimoto, R. Itô leg.; at streetlight and by beating withered grasses (Fig. 6F); 1♂1♀ [21MS01, 21MS02] • Kumage District, Yakushima Town, Nagata, near Nagatainaka Beach (Site 8); 30.4097°N, 130.4360°E; 10 m alt.; 4.V.2017; K. Arimoto, R. Itô, R. Noda leg.; by beating withered grasses; 4♀ [21MS03–21MS06] • Kumage District, Yakushima Town, Koseda (Site 10); 30.3960°N, 130.6424°E; 40 m alt.; 6.V.2017; K. Arimoto, R. Itô, R. Noda leg.; by beating withered grasses; 1♀ [21MS07] • Kumage District, Yakushima Town, Kojima (Site 27); 30.2342°N, 130.5323°E; 4 m alt.; 3.V.2017; K. Arimoto, R. Itô, R. Noda leg.; 1♂ [21MS08].

Identification. Body length 14.0–15.9 mm; color blackish red, with antennae and legs reddish brown; body covered with yellowish-white setae; antennae extending beyond pronotum posterior lateral apices by apical antennomere in male, not reaching pronotum posterior lateral apices by apical antennomere in female; antennomeres IV–X serrate; pronotum longer than wide; prosternal process inclined in profile; claws pectinate; apices of parameres beyond preapical expansion longer than wide; bursa copulatrix globular; long sac extending from bursa copulatrix, without sclerotized spines.

This species is endemic to the area around the Ôsumi Islands and Tokara Islands (Kishii, 1999).

Melanotus (*Melanotus*) *senilis yakuinsulanus* Kishii, 1986

Figure 4K

Melanotus senilis Candèze 1864—Miwa 1929: 346.
Melanotus (*Melanotus*) *senilis yakuinsulanus* Kishii 1986: 52.

Material examined. – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Nagata, near Nagatainaka Beach (Site 8); 30.4097°N, 130.4360°E; 10 m alt.; 4.V.2017; K. Arimoto, R. Itô, R. Noda leg.; 1♀ [21MSY01].

Identification. Body length 10.6 mm; color greyish black, with antennae and legs reddish brown; body covered with yellowish-white setae; antennae extending beyond pronotum posterior lateral apices by apical antennomere; antennomeres IV–X serrate; pronotum almost as long as wide; prosternal process inclined in profile; claws pectinate; apices of parameres beyond preapical expansion longer than wide; bursa copulatrix globular; long sac extending from bursa copulatrix, with sclerotized spines.

This subspecies is endemic to Yaku and Kuchinoerabu islands (Table 2).

Melanotus (*Melanotus*) *spernendus kosugi* Kishii, 1975

Figure 4L

Melanotus spernendus—Miwa 1929: 346.
Melanotus (*Melanotus*) *spernendus kosugi* Kishii 1975: 4.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Onoaida, near Yodogawa Trailhead (Site 20); 30.2995°N, 130.5337°E; 1370 m alt.; 6.V.2017; K. Arimoto, R. Itô, R. Noda leg.; from under the bark of *Cryptomeria japonica*, by spraying; 2♂ [21MSK01, 21MSK02].

Identification. Body length 11.8–12.4 mm; color dark orange, with antennae and legs reddish brown; body covered with yellow setae; antennae extending beyond pronotum posterior lateral apices by apical two antennomeres, not reaching pronotum posterior lateral apices by apical antennomere in female; antennomeres IV–X serrate; pronotum shorter than wide; prosternal process inclined in profile; claws pectinate; apices of parameres beyond preapical expansion longer than wide; bursa copulatrix short and subcylindrical; long sac extending from bursa copulatrix, without sclerotized spines.

This subspecies is endemic Yaku Island (Table 2).

Mulsanteus junior yakuensis (Kishii, 1983)

Figure 5A

Neotrichophorus junior (Candèze 1873)—Nakane and Kishii 1958: 39.
Neotrichophorus junior yakuensis Kishii 1983a: 37.
Mulsanteus junior yakuensis—Kishii 1999: 81.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Koseda (Site 10); 30.3960°N, 130.6424°E; 40 m alt.; 6.V.2017; K. Arimoto, R. Itô, R. Noda leg.; by looking on a leaf of *Pleioblastus simonii* (Carr.) Nakai at night; 1♂1♀ [21MJY01, 21MJY02].

Identification. Body length 13.0–14.3 mm; color blackish brown, with antennae and legs blackish red to brown; body covered with yellow setae, each hind angle of pronotum with hair bundle; antennae extending beyond pronotum posterior lateral apices by apical three antennomeres in male, extending beyond pronotum posterior

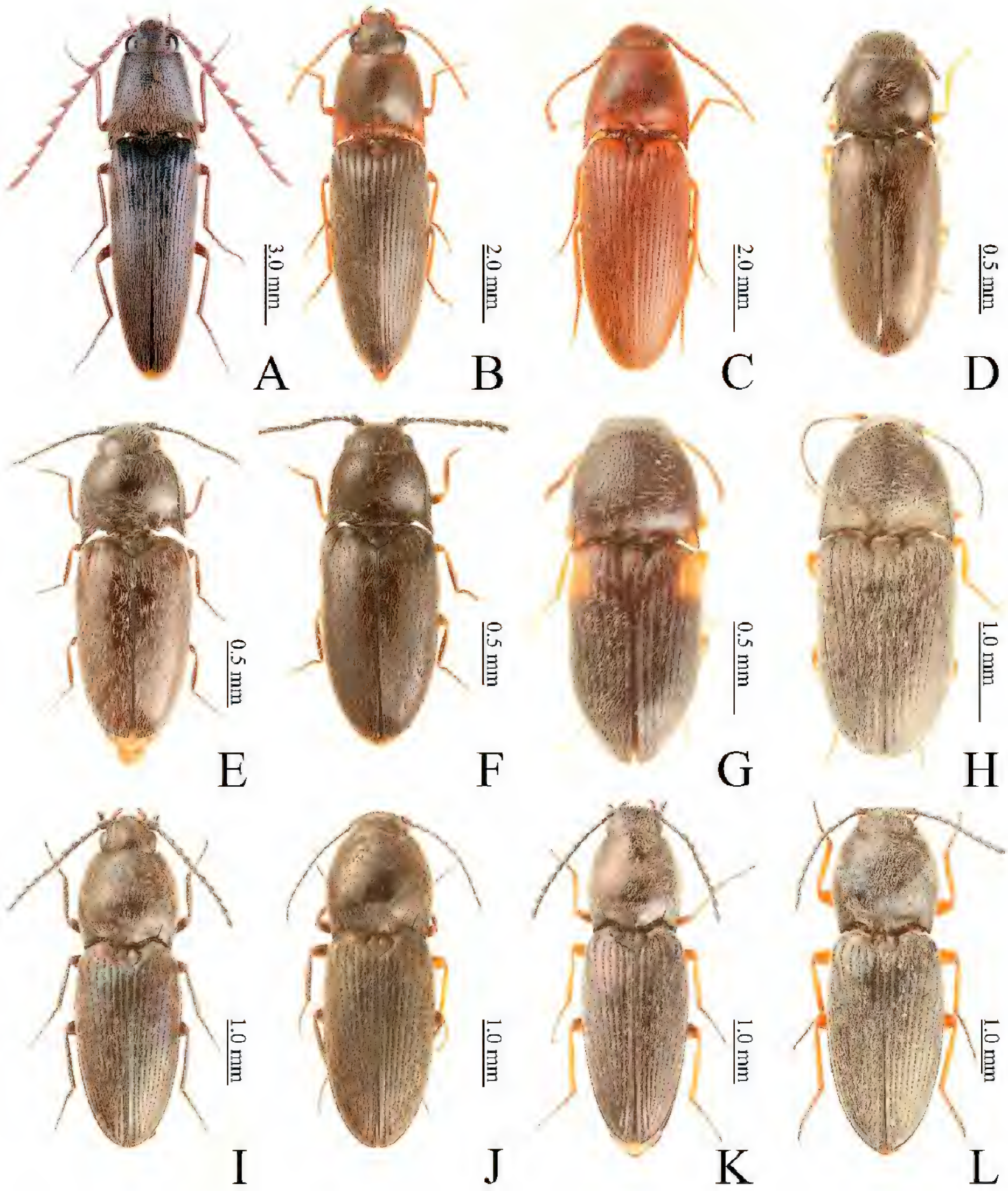

Figure 5. Elaterid species, habitus, dorsal view. **A.** *Mulsanteus junior yakuensis*, male [21MJY01]. **B.** *Parasilesis musculus yaku*, female [21PMY09]. **C.** *Podeonius aquilus ryukyuensis*, male [21PAR01]. **D.** *Miquasus ohkurai*, male [21MO01] **E.** *Quasimus satoi kimurai*, male [21QSK01]. **F.** *Yukoana tamui*, female [21YT01]. **G.** *Zorochros* (*Pronegastrius*) *humeralis yakuensis*, male [21ZHY01]. **H.** *Zorochros* (*Yamatostrius*) *osawai*, male [21ZO02]. **I.** *Paracardiophorus nakanei nakanei*, male [21PNN01]. **J.** *Paracardiophorus pullatus pullatus*, female [21PP08]. **K.** *Paracardiophorus sequens purpuratus*, male [21PSP01]. **L.** *Paracardiophorus tokara yakuensis*, male [21PTY03].

lateral apices by apical antennomere in female; antennomeres IV–X serrate; pronotum longer than wide; hind angles of pronotum unicarinate; apices of parameres beyond preapical expansion shorter than wide.

This subspecies is endemic to Yaku Island (Table 2).

Parasilesis musculus yaku (Kishii, 1976)

Figure 5B

Silesis musculus Candèze 1873—Kishii 1959: 18.
Silesis yaku Kishii 1976c: 51.
Silesis musculus yaku—Ôhira 1988: 21.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Issô (Site 2); 30.4544°N, 130.4976°E; 4 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; beach, by looking; 2♀ [21PMY01, 21PMY02] • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 18.VII.2018; K. Arimoto leg.; by SLT; 4♀ [21PMY03–21PMY06] • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Sites 13–15); 30.3971°N, 130.5614°E–30.3833°N, 130.5727°E; 360–640 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by sweeping the flowers of trees during the day; 2♂5♀ [21PMY07–21PMY13] • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Site 14); 30.3882°N, 130.5713°E; 580 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by SLT; 2♀ [21PMY14, 21PMY15].

Identification. Body length 7.0–9.0 mm; color blackish brown, partly reddish, with antennae and legs orange to brown; body covered with yellow setae; supra-antennal carina straight apically; antennae not reaching pronotum posterior lateral apices by apical antennomere; antennomeres IV–X serrate; pronotum almost as long as wide; tarsomere IV lamellate; claws pectinate.

Ôhira (1990a) established the genus *Parasilesis*, including in it *Silesis musculus*. Kishii (1999) synonymized *Parasilesis* with *Silesis*, but did not provide evidence or a discussion. We follow the treatment of Ôhira (1988, 1990a) and use *Parasilesis musculus yaku*.

This subspecies is endemic to Yaku Island (Table 2).

Podeonius aquilus ryukyuensis (Ôhira, 1968)

Figure 5C

Anchastus aquilus Candèze 1873—Nakane and Kishii 1958: 37.
Anchastus aquilus ryukyuensis Ôhira 1968: 134.
Akitsu aquilus ryukyuensis—Kishii 1999: 72.
Podeonius aquilus ryukyuensis—Ôhira 2003: 20.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Koseda (Site 11); 30.3831°N, 130.6244°E; 190 m alt.; 18.VII.2018; K. Arimoto leg.; 1♂: by looking during the day, 2♂1♀: by SLT; 3♂1♀ [21PAR01–21PAR04].

Identification. Body length 7.9–9.1 mm; color brown to reddish brown, partly black, with antennae and legs reddish brown; body covered with yellow setae; antennae extending beyond pronotum posterior lateral apices by apical two antennomeres in male, just reaching pronotum posterior lateral apices by apical antennomere in female; antennomeres III–X serrate; pronotum shorter than wide; hind angles of pronotum bicarinate; tarsomere III lamellate; apices of parameres beyond preapical expansion shorter than wide.

Kishii (1999) treated the Yaku Island population as a distinct subspecies distributed in the Ryukyu Islands, while Ôhira (2003) considered this population to belong to the nominotypical subspecies, which is widely distributed in mainland Japan. We follow Kishii (1999).

Subfamily Negastriinae Nakane & Kishii, 1956

Miquasus ohkurai Ôhira, 1992

Figure 5D

Miquasus ohkurai Ôhira 1992: 123.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Sites 13–15); 30.3971°N, 130.5614°E–30.3833°N, 130.5727°E; 360–640 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by sweeping the flowers and leaves of trees during the day; 1♂2♀ [21MO01–21 MO03].

Identification. Body length 2.4 mm; color black, with antennae black, legs blackish brown, partly orange; body covered with yellowish-white setae; antennae extending pronotum posterior lateral apices by apical two antennomeres in male, not reaching pronotum posterior lateral apices by apical two antennomeres in female; antennomeres II shorter than III; pronotum shorter than wide; hind angles of pronotum strongly pointed; scutellar shield longer than wide, without depression; mesosternum and metasternum fused between mesocoxae; each apical outer edge of parameres with horn-like projection.

This species is endemic to the Yaku Island (Table 2).

Quasimus satoi kimurai Kishii, 1970

Figure 5E

Quasimus satoi kimurai Kishii 1970: 12.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Sites 13–15); 30.3971°N, 130.5614°E–30.3833°N, 130.5727°E; 360–640 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by sweeping the flowers and leaves of trees during the day; 2♂1♀ [21QSK01–21QSK03].

Identification. Body length 2.1–2.3 mm; color black, with antennae black but basal several antennomeres yellowish brown, legs yellowish brown; body covered with white setae; antennae not reaching pronotum posterior lateral apices by apical antennomere; antennomeres II longer than III; pronotum shorter than wide; scutellar shield shorter than wide; depression of scutellar shield shorter than wide, pentagonal.

This subspecies is endemic to the Yaku Island (Table 2).

Yukoana tamui Kishii, 1959

Figure 5F

Yukoana tamui Kishii 1959: 7.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Miyanoura, along Prefectural Route 594 (Sites 13–15); 30.3971°N, 130.5614°E–30.3833°N, 130.5727°E; 360–640 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; by sweeping the flowers and leaves of trees during the day; 1♂3♀ [21YT01–21YT04].

Identification. Body length 2.5–3.5 mm; color black, antennae black, legs blackish brown, partly orange; body covered with yellow setae; antennae not reaching pronotum posterior lateral apices by apical antennomere; antennomeres II shorter than III; pronotum shorter than wide; scutellar shield shorter than wide; depression of scutellar shield longer than wide, elliptical.

Zorochros (*Pronegastrius*) *humeralis yakuensis* (Kishii, 1976)

Figure 5G

Negastrius humeralis (Candèze, 1873)—Nakane and Kishii 1958: 36.
Pronegastrius (*Pronegastrius*) *humeralis yakuensis* Kishii 1976b: 29.
Zorochros (*Pronegastrius*) *humeralis yakuensis*—Kishii 1999: 105.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Shitogo (Site 3); 30.4492°N, 130.5199°E; 5 m alt.; 4.V.2017; K. Arimoto, R. Itô, R. Noda leg.; grassland near the seaside (Fig. 6A), by spraying; 3♂2♀ [21ZHY01–21ZHY05] • Kumage District, Yakushima Town, Miyanoura (Site 5); 30.4236°N, 130.5777°E; 1 m alt.; 18.VII.2018; K. Arimoto leg.; sandy beach, by spraying; 1♂1♀ [21ZHY06, 21ZHY07].

Identification. Body length 1.9–2.2 mm; color black to blackish brown, with antennae black but basal several antennomeres yellowish brown, hind angles of pronotum and elytral humerus with yellow markings, but markings reduced in some; body covered with white setae; antennae not reaching pronotum posterior lateral apices by apical antennomere; pronotum shorter than wide; hypomeron depressed and for reception of antennae.

This subspecies had been treated as endemic to Yaku Island (Kishii 1976b, 1999). Arimoto and Itô (2018) also recorded the subspecies from Tanegashima Island.

Zorochros (*Yamatostrius*) *osawai* (Ôhira, 1972)

Figure 5H

Negastrius osawai Ôhira 1972: 20.
Monadicus (*Yamatostrius*) *osawai*—Kishii 1976b: 27.
Zorochros (*Yamatostrius*) *osawai*—Kishii 1999: 105.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Shitogo (Site 3); 30.4492°N, 130.5199°E; 5 m alt.; 4.V.2017; K. Arimoto, R. Itô, R. Noda leg.; grassland near the seaside (Fig. 6A), by spraying; 1♀ [21ZO01] • Kumage District, Yakushima Town, Nagata, Nagatainaka Beach (Site 7); 30.4099°N, 130.4357°E; 6 m alt.; 4.V.2017; K. Arimoto, R. Itô, R. Noda leg.; found on a sandy beach (Figs. 6C, 7A) and by spraying; 21♂10♀ [21ZO02–21ZO32] • Kumage District, Yakushima Town, Anbô, Haruta Beach (Site 19); 30.3013°N, 130.6527°E; 5 m alt.; 19.VII.2018; K. Arimoto leg.; sandy beach, by spraying; 2♂1♀ [21ZO33–21ZO35] • Kumage District, Yakushima Town, Kurio, Kurio Beach (Site 24); 30.2671°N, 130.4222°E; 6 m alt.; 3.V.2017; K. Arimoto, R. Itô, R. Noda leg.; sandy beach, by spraying; 5♂1♀ [21ZO36–21ZO41].

Identification. Body length 2.7–3.8 mm; color black, with antennae black but basal three antennomeres yellowish brown, legs yellowish brown; body covered with white setae; antennae not reaching pronotum posterior lateral apices by apical antennomere; pronotum shorter than wide; hind angles of prothorax broad and thick; carinae of pronotal hind angles more than half of pronotum length.

Subfamily Cardiophorinae Candèze, 1859

Paracardiophorus nakanei nakanei Ôhira, 1986

Figure 5I

Paracardiophorus nakanei nakanei Ôhira 1986b: 215.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Shitogo (Site 3); 30.4492°N, 130.5199°E; 5 m alt.; 4.V.2017; K. Arimoto, R. Itô, R. Noda leg.; grassland near the seaside (Fig. 6A), by spraying; 1♂[21PNN01].

Identification. Body length 5.0 mm; color black, with antennae black, legs black, partly orange; body covered with yellowish-white setae; antennae not reaching pronotum posterior lateral apices by apical antennomere; pronotum almost as long as wide; apicomedial expansions of parameres wide; distal sclerite in bursa copulatrix pipe-like and with two branches.

Remarks. This subspecies was originally described from Yaku Island. Since its original description, this subspecies has been recorded twice from Yaku Island (Ôhira 1997c, 2001b) and once from Kuchinoerabu Island (Ôhira 1997c).

The type specimens were collected from gravel near a field (Ôhira 1986b). The specimens examined here were collected from grassland near the seaside (Fig. 6A), together with *P. pullatus pullatus*. These species are thought to prefer wasteland, while *P. sequens* and *P. tokara* prefer relatively sandy beaches (Arimoto 2014; Arimoto and Itô 2018; this study).

Paracardiophorus pullatus pullatus (Candèze, 1873)

Figure 5J

Cardiophorus pullatus Candèze 1873: 16.
Paracardiophorus pullatus—Schwarz 1895: 40.
Paracardiophorus subaeneus (Fleutiaux, 1902)—Ôhira 1986c: 36.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Shitogo (Site 3); 30.4492°N, 130.5199°E; 5 m alt.; 4.V.2017; K. Arimoto, R. Itô, R. Noda leg.; grassland near the seaside (Fig. 6A), by spraying; 7♂2♀ [21PP01–21PP09].

Identification. Body length 4.4–5.3 mm; color black, with antennae black, legs black, in some partly orange; body covered with yellowish-white setae; antennae extending beyond pronotum posterior lateral apices by apical antennomere in male, just reaching or not reaching pronotum posterior lateral apices by apical antennomere in female; pronotum slightly longer than in male, slightly shorter than wide in female; apicomedial expansions of parameres short; distal sclerite in bursa copulatrix pipe-like and with a branch.

***Paracardiophorus sequens purpuratus* Kishii, 1977**
Figure 5K

Paracardiophorus sequens (Candèze 1873)—Kishii 1959: 19.
Paracardiophorus sequens purpuratus Kishii 1977: 55.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Miyanoura (Site 5); 30.4236°N, 130.5777°E; 1 m alt.; 3.V.2017; K. Arimoto, R. Itô, R. Noda leg.; found under and between stones on a sandy beach (Fig. 7B, C), observed on stones in some (Fig. 7D) and by spraying; 5♂7♀ [21PSP01–21PSP12] • Kumage District, Yakushima Town, Koseda (Site 9); 30.4009°N, 130.6383°E; 5 m alt.; 18.VII.2018; K. Arimoto leg.; sandy beach, by spraying; 1♂ [21PSP13].

Identification. Body length 5.3–6.8 mm; color black, with antennae black, legs orange, in some partly blackish; body covered with yellowish-white setae; antennae extending beyond pronotum posterior lateral apices by apical antennomere in male, not reaching pronotum posterior lateral apices by apical antennomere in female; pronotum slightly longer than wide; apicomedial expansions of parameres very wide; distal sclerite in bursa copulatrix pipe-like and with two branches.

This subspecies was originally described from a beach on Yaku Island. Kishii (2006) recorded a female from Yaku Island since the original description. This subspecies is thought to be endemic to Yaku Island (Table 2). Populations in the Kuchinoerabu and Tanegashima islands have been treated as the nominotypical subspecies (Arimoto and Itô 2018).

***Paracardiophorus tokara yakuensis* Ôhira, 1970**
Figure 5L

Paracardiophorus tokara yakuensis Ôhira 1970: 12.

Material examined. JAPAN – **Kagoshima Prefecture** • Kumage District, Yakushima Town, Issô (Site 2); 30.4544°N, 130.4976°E; 4 m alt.; 14.VII.2017; K. Arimoto, R. Itô leg.; found under and between stones on a sandy beach and by spraying; 1♂1♀ [21PTY01, 21PTY02] • Kumage District, Yakushima Town, Nagata, Nagatainaka Beach (Site 7); 30.4099°N, 130.4357°E; 6 m alt.; 4.V.2017; K. Arimoto, R. Itô, R. Noda leg.; found under and between stones on a sandy beach (Fig. 6C) and by spraying; 3♂1♀ [21PTY03–21PTY06] • Kumage District, Yakushima Town, Anbô, Haruta Beach (Site 19); 30.3013°N, 130.6527°E; 5 m alt.; 19.VII.2018; K. Arimoto leg.; found under and between stones on a sandy beach and by spraying; 1♂1♀ [21PTY07, 21PTY08] • Kumage District, Yakushima Town, Kurio, Kurio Beach (Site 24); 30.2671°N, 130.4222°E; 6 m alt.; 3.V.2017; K. Arimoto, R. Itô, R. Noda leg.; found under and between stones on a sandy beach and by spraying; 7♂3♀ [21PTY09–21PTY18].

Identification. Body length 5.2–7.0 mm; color black, antennae black, with legs orange, partly blackish in some; body covered with yellowish-white setae; antennae just reaching pronotum posterior lateral apices by apical antennomere in male, not reaching pronotum posterior lateral apices by apical antennomere in female; pronotum almost as long as wide; apicomedial expansions of parameres short and pointed anteriorly; distal sclerite in bursa copulatrix pipe-like and with a branch.

This subspecies is endemic to the Yaku Island (Table 2). Kishii (2004) recorded this subspecies from the island after the original description.

Discussion

After Kishii (1999) recognized 89 species from Yaku Island, Ôhira and Sano (1999) recorded *Agrypnus* (*Sagojyo*) *yuppe* (Kishii, 1964), Kubota (2001) recorded *Suzukielater babai* (Kishii & Ôhira, 1956), Suzuki (2002) recorded *Tetrigus lewisi* Candèze, 1873, and Takakuwa and Fujita (2010) recorded *Babadrasterius urabensis* Ôhira, 1994 for the first time. Subsequently, a new endemic species, *Agaripenthes yakuensis* Arimoto, 2011, was described. Ôhira (2002b) and Kishii (2006) also recorded many already reported species from the island.

Agaripenthes shibatai (Kishii, 1969) is endemic to Yaku Island (Ôhira 1997b), although Hirashima (1989) did not list it. Hirashima (1989) recognized *Agrypnus* (*Colaulon*) *tsukamotoi* (Kishii, 1956) from Yaku Island, while Kishii (1999) did not recognize it from the island. Ôhira (2004) synonymized *Agrypnus* (*Colaulon*) *tsukamotoi satsuma* Kishii, 1996 under *Agrypnus* (*Colaulon*) *tsukamotoi* and included Yaku Island in its distribution, and we follow this here. Hirashima (1989) also recognized *Paracardiophorus opacus* (Lewis, 1894) from Yaku Island; however, the source of this information is unknown; Nakane (1984) and Kishii (1999) did not recognize *P. opacus* from Yaku Island, and Ôhira (1997c), who reviewed the Japanese *Paracardiophorus*, also did not recognize *P. opacus* from the island. Here, we remove *P. opacus* from the list of species on the island. Arimoto (2022) synonymized *Ectamenogonus yakuensis* (Ôhira, 1970), which was thought to be endemic to Yaku Island, under *E. plebejus* (Candèze, 1873), which is distributed widely in eastern Asia. Arimoto (2022) also removed *E. robustus* (Kishii, 1966) from the list of species on the island.

Hirashima (1989) and Kishii (1999) did not recognize *Rismethus ryukyuensis* from Yaku Island, while Kamezawa (2014) and Arimoto (2014) included this species in the Yaku fauna. Ôhira (1975, 1986a) examined this species and did not record it from Yaku Island. The first mention of this species from Yaku Island was by Ôhira (1995: 193), who wrote "this species is known from the northern limit of Kyushu (Nagasaki Prefecture) to the Ryukyu Islands ranging between Yaku Island and Hateruma Island"; however, Ôhira (1995) did not give collection data. Ôhira (1999d) also mentioned a record from Yaku Island but did not provide collection data. In our study, this species is recognized from Yaku Island.

Kishii (1959) recorded *Zorochros* (*Yamatostrius*) *albipilis* (Candèze, 1873) (= *Negastrius albipilis*) from

Figure 6. Environments of the collection sites. **A, B.** Site 3. **C, D.** Site 7. **E.** Site 12. **F.** Site 4. The site numbers correspond to those of Table 1. **A.** Grassland near the seaside. **B.** *Rismethus ryukyuensis* under a rock in grassland near the seaside (arrow: an individual in a hollow in the stone). **C.** Sandy beach. **D.** Vegetation on a sandy beach. **E.** Simple light trap set in a lowland forest. **F.** Withered grasses near the seaside.

Yaku Island. Okadome (1973) and Nakane (1984) recognized *Z.* (*Y.*) *albipilis* from the island, following Kishii (1959). Subsequently, Kishii (1976b) stated that the record by Kishii (1959) was based on misidentification of *Z.* (*Y.*) *osawai*. Hirashima (1989) and Kishii (1999) recognized *Z.* (*Y.*) *osawai* from the island following Kishii (1976b). In our study, *Z.* (*Y.*) *osawai* is recognized from Yaku Island.

Ôhira (1998a) stated that *Elater niponensis* (Lewis, 1894) is distributed on Yaku Island, but no specimen data were presented. Kishii (1999) did not recognize the species from the island. A specimen of *E. niponensis* from Yaku Island was found in the Ôhira collection in OMNH, but the specimen has two data labels attached (Fig. 3K). It is difficult to determine which label is correct because the species is widely distributed in mainland Japan. The possible distribution of *E. niponensis* on Yaku Island cannot be ruled out, but here, we remove the species from the list of species on Yaku Island.

We conclude that 95 elaterid species in 48 genera of six subfamilies occur on Yaku Island (Table 2), which account for approximately 15% of the 640 Japanese

Figure 7. Environments of the collection sites. **A.** Site 7. **B, C, D.** Site 5. **A.** *Zorochros* (*Yamatostrius*) *osawai* on a sandy beach. **B.** Vegetation on a sandy beach. **C.** *Paracardiophorus sequens purpuratus* on a sandy beach. **D.** *Paracardiophorus sequens purpuratus* on a stone on a sandy beach.

elaterid species (Kishii 1999). There are 14 endemic species (14.7% of the elaterid species from Yaku Island) and 20 endemic subspecies (21.1%) from Yaku Island (Table 2). Five subspecies are endemic to the Ôsumi Islands. Yaku Island is the southern limit of the distribution of 47 species (49.5%), of which most species are common on mainland Japan, and the northern limit of the distribution of six species (6.3%) distributed in the Ryukyu Islands (Table 2). The elaterid fauna of Yaku Island has been characterized by endemic species inhabiting highlands on Yaku Island, such as *Homotechnes ogatai* (Kishii, 1983), *Actenicerus yaku* Nakane & Kishii, 1958, *Scutellathous yakuensis* Nakane & Kishii, 1958, *Ampedus* (*Ampedus*) *ogatai* Kishii, 1983, *Ampedus* (*Ampedus*) *sawadai* Kishii, 1985, and *Dalopius yakuensis* Kishii, 1975 (Table 2), and species common to mainland Japan. The taxonomic statuses of the Yaku endemic subspecies need to be reviewed, including populations from neighboring Kuchinoerabu and Tanegashima islands, because the species inhabit lowlands and are common to mainland Japan and around the Ôsumi Islands. Although Yaku and Tanegashima islands share 39 species (41.1% of those from Yaku Island, 90.7% of those from Tanegashima Island) (Arimoto and Itô 2018), populations from Tanegashima Island were not considered while describing endemic subspecies from Yaku Island.

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Authors' Contributions

Conceptualization: KA. Data curation: KA. Formal analysis: KA. Investigation: KA, RI, RN. Methodology: KA. Project administration: KA. Resources: KA, RI, RN. Supervision: KA. Visualization: KA. Writing – original draft: KA. Writing – review and editing: KA.

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